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I. Analysis of Trucking Charges

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The Transportation of New Hampshire Milk

I. Analysis of Trucking Charges[1]

By Alan MacLeod and Mary L. Geraghty

The preceding study of this series, "The Milksheds of New Hampshire," outlined the areas furnishing milk to various markets and summarized data regarding them. The question which then presents itself is how the milk moves from these areas of supply to the markets where it is consumed.

This question is a large one and only a part of it can be answered here. This study is limited, therefore, to a consideration of the trucking of milk from the farm to the country station or city plant. Particular emphasis is laid upon the charges levied upon the milk as these are commonly deducted directly from the farmer's check. A forthcoming publication will discuss possible reorganization and rearrangement of truck routes.

The Problem

High costs of distribution adversely affect returns to fluid milk producers. Many of the costs of milk collection and distribution lie outside the influence of the producer and he has difficulty in doing anything about them. But the hauling of milk from farm to country station or city plant is an operation upon which the producer can exert an influence.

Within recent years, studies have been made of milk transportation in several sections of the United States.[2] In general these studies have

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[1] This is a New Hampshire publication in the New England-wide milk marketing study, which is sponsored by the New England Research Council. We wish to express our appreciation to the truck operators, plant officials and farmers who supplied information for this study.

[2] Among such studies are the following:

Bartlett, R. W., and Caskey, W. F.; Milk Transportation Problems in the St. Louis Milkshed; Illinois Agricultural Experiment Station Bulletin 430, 1937.

Dow, Geo. F.; An Economic Study of the Collection of Milk and Cream in Maine; Maine Agricultural Experiment Station Bulletin 373, 1934.

Dow, Geo. F.; Costs and Returns in Operating Milk and Cream Collection Routes in Maine; Maine Agricultural Experiment Station Bulletin 374, 1934.

Hammerberg, D. O., and Sullivan, W. G.; An Economic Analysis of the Charges for Transporting Milk to Connecticut Markets; Connecticut Agricultural Experiment Station Mimeograph, 1937.

Mortenson, W. P.; An Economic Study of the Milwaukee Milk Market; Wisconsin Agricultural Experiment Station Research Bulletin 113, 1932.

Scanlan, John J.; Transportation of Milk in the Philadelphia Milkshed; Farm Credit Administration Bulletin 13, 1937.

Spencer, Leland; An Economic Study of the Collection of Milk at Country Plants in New York; Cornell University Agricultural Experiment Station Bulletin 486, 1929.

Tinley, J. M., and Blank, Martin H.; An Analysis of the East Bay Milk Market; California Agricultural Experiment Station Bulletin 534, 1932.

indicated a haphazard, planless system not only so far as trucks or wagons are concerned but also of transportation routes and of hauling charges. With few exceptions, at the time these studies were made, no concerted efforts had been made to put the transportation of milk upon an orderly and efficient basis. Trucks might be running at less than half or more than twice rated capacity and might be of models not adapted to milk hauling. Routes frequently crisscrossed or paralleled one another with resultant duplication of distance traveled. Charges often bore no discoverable relationship to services rendered.

In the light of findings such as these, the desirability of investigating the situation in New Hampshire is evident. Much New Hampshire milk is sold at wholesale. And all wholesale dairymen are affected by the manner in which their milk is assembled from the farm to the plant where it is processed. Producers benefit when these assembling processes are efficient and the effects of the efficiency are reflected back in the form of low assembling charges. Conversely, producers suffer when inefficiency is present or charges are not based on services rendered, or both.

The term "assembling" is used here to include all operations performed in taking the milk from the farm on which it is produced to the plant in which it is processed for distribution. Included, therefore, are the transporting of milk from farm to country station, the operation of country stations, and the transporting of milk from country station to city plant.

Only the first of these operations, the transporting of milk from farm to country station (or city plant, where milk is directly shipped), is considered here. By limiting the scope of this study to the trucking of milk, greater emphasis can be placed at this time on this phase of the assembling process, and information of value can be released without delay.

Method and Scope of Study

The study was conducted on a state-wide basis.

An attempt was made to include all commercial trucking of milk from farms in New Hampshire in June, 1937. Data obtained regarding the truck routes included the following:

1. Type of operator (whether employed by dealer, independent hauler, transporting co-operative, and so forth) and contract made.
2. Description of route. This included the plotting on a map of the actual route taken by the truck in collecting milk and the location of the stops. From the map, estimates were made of the total distance traveled, of the distance between the first and last stop, and that traveled without making stops, and of the distance traveled on hard roads and on unpaved roads.
3. Services rendered—whether ice was furnished by the trucker and, if so, when and how much; the number of stops made at individual farms and at collection points on the main road. If any additional services were rendered, they were noted.
4. The amount of milk carried by each truck in June, 1937.
5. Description of the truck, including any other uses to which it was put.

6. The time taken from when the truck left the garage until it arrived at the dealer's plant.

7. The number of men sent on the truck.

8. The charges made for transporting milk. Variations in charges for different producers on the same truck route and any special charges made were noted.

These data were obtained in most cases either from truck drivers or plant officials. In a very few cases it proved impossible or impracticable to reach either of these sources of information and in such cases data are sometimes incomplete or estimated.

Apart from supplying a larger number of routes for detailed analysis, the inclusion of all truck routes within the state was unnecessary for the purposes of this study. It was felt, however, that the study to follow—one showing possible rearrangement and reorganization of milk transportation within New Hampshire—would require a knowledge of all truck routes in an area, and not only those supplying a particular market or a particular station. For this reason, all commercial truck routes securing milk from New Hampshire farms (in so far as the routes could be found) were studied.

As in the first bulletin of this series,[3] this study is a cross section analysis, and consequently the time when the study was made influences the results obtained. The year 1937 was one of unsettled conditions in the Boston market though local New Hampshire markets were quiet. During the first part of the year when a milk strike was in operation against certain Boston dealers, many producers formerly delivering to dealers' plants diverted their milk to co-operatively owned or controlled plants. Three co-operative plants were built (two at locations where dealers' plants were already operating) and one dealer's plant was bought by a co-operative. Prices paid at plants varied tremendously with little relation to distance from market, quality of milk, regularity of production, or other customary price influencing factors. Following the reinstatement of the Federal Order in the Boston market in August, 1937, (even though only a part of the distributors complied with the order) extreme price variations between distributors vanished and more settled conditions returned to the Boston milkshed.

Despite these troubled market conditions, the trucking of milk was not greatly affected. A few new routes were formed and in some cases a few producers were shifted between truck drivers, but in general, truck routes were not altered. Almost the only significant result was that in the two northern towns, Lancaster and Colebrook, where new plants were built, many truck drivers delivered milk to an additional plant. How long a situation where the same truck picks up milk for two or three plants will endure is difficult to predict, but six months after the new plants were opened very few changes in routes were reported.

It appeared, therefore, as though 1937, in spite of being a year of change in the Boston market, would give a picture of trucking in New Hampshire that showed little distortion. Economic changes take place

[3] MacLeod, Alan; The Milksheds of New Hampshire; New Hampshire Agricultural Experiment Station Bulletin 295, 1937.

ceaselessly and any period selected would include some unstable conditions.

In order to estimate the percentage of capacity to which equipment and personnel were used, the month of June was selected. Ordinarily this is the month of peak milk production in New Hampshire and it would, therefore, utilize trucking facilities to the greatest extent of any period of the year. Figure 1 shows that in 1937 average deliveries of milk per day, per dairy, to handlers at Boston were highest in the month of June. While these figures include producers throughout the Boston milkshed, they give an indication of the seasonality of milk production in New Hampshire.

Figure 1. Average deliveries of milk per day, per dairy, to handlers in Boston, 1937. (See Appendix Table I)

It was felt desirable to indicate graphically for at least two markets all deliveries of milk by any agency in order to give a more complete picture of the flow of milk from farms to country stations or city plants. This resulted in a number of routes being indicated for producers delivering their own milk. From the standpoint of analyzing trucking charges, these producers are not of great interest; but they do, nevertheless, make up a part of the trucking picture. Conceivably, if reorganization of truck routes could take place in such a way that rates were lowered, some of these producers might cease hauling their own milk.

The two markets selected as indicating typical trucking situations are Nashua and Lancaster, the former a local market and the latter the site of two collection stations for milk moving to Boston. In addition to indicating different trucking patterns because of different market outlets, the two areas, one in the south of the state and the other in the north, show the influences of different supply areas. Figure 2 shows the Lancaster and Nashua milksheds.

After a detailed presentation of conditions in these two typical areas, the characteristics of the commercial truck routes throughout the whole state are analyzed. While data regarding the various characteristics of these routes are presented, most of the attention is placed upon the trucking charges levied upon producers. These charges are analyzed

carefully and in considerable detail in an attempt to determine their amount and the bases upon which they were set.

To a future publication are left analyses of route duplication and reorganization possibilities. Such reorganization often involves relocation of plant facilities and allocation of producers between markets. This phase of the milk supply problem is now being studied and will appear at an early date.

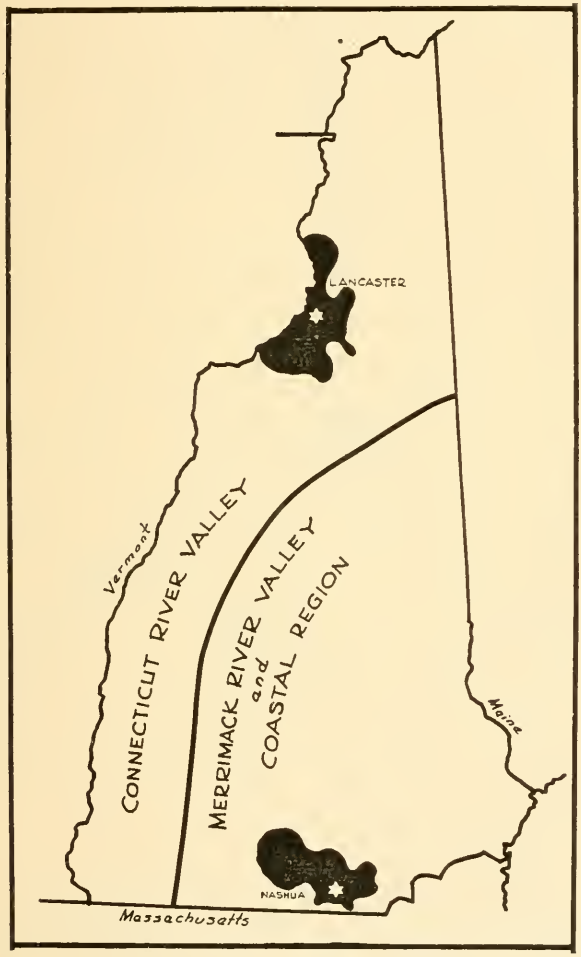

FIGURE 2.
Outline map of New Hampshire. Black areas show the Lancaster and Nashua milksheds. The state was divided into two sections in order to analyze the truck routes. This division is indicated by the heavy black line.

Transportation of Milk to Lancaster

Considerably more than one-half of the New Hampshire milk carried on commercial trucking routes goes to stations supplying the Boston market. Therefore, a typical Boston supply area, that surrounding Lancaster, is given first consideration.

Lancaster is a town of some 2,900 population, situated in the northern part of the state in the Connecticut River valley. Local milk distribution is entirely in the hands of producer-distributors and so does not

enter into the trucking picture. Prior to August, 1937, only one Boston plant was in operation, though early in that year a reloading station was opened pending the construction of a co-operative plant. This reloading station had much the same effect on the trucking of milk as would an additional plant, and in this study is treated as a separate plant.

At the time of the study, milk was coming to Lancaster from an area the most of which could be enclosed in a circle with a radius of twelve miles. Such a circle would include a part of Vermont, but only a few Vermont producers send their milk to Lancaster plants. This production area is in one of the best dairy sections of the state. Production is relatively concentrated, as shown by the fact that amounts varying from 35,000 to 65,000 pounds of milk have been produced daily for the Boston market in recent years in this area. About 300 producers normally send their milk to Lancaster plants.

Figure 3 shows the routes taken by milk coming to the Lancaster plants. In maps on file at the Experiment Station each truck route is indicated together with farm stops and any stops at collection points on the main road. These details, while valuable for some purposes would seem only to complicate the presentation here and so are omitted. Instead, an attempt has been made to indicate the general course of the various routes together with the amount of milk carried on each. This is done by varying the width of the line representing each route in accordance with the total amount of milk carried upon it. Commercial truck routes are shown by solid lines; routes of individuals hauling their own milk, by broken lines. Where routes follow one another over the same road, this is indicated in the diagram by lines running parallel and close to one another. Routes going to other markets and entering the territory included in the diagram are shown by dotted lines.

These routes are shown as they were in June, 1937. At that time, because of the unsettled market conditions, some milk which formerly came to Lancaster from Vermont was diverted to Concord, Vermont; and receipts at Lancaster were thus somewhat below normal. Estimated amounts of milk carried on the various truck routes in June were difficult to secure and in many cases were calculated from the volumes carried in an earlier month. In making this adjustment, all routes were assumed to have the same seasonal variation in production as the average for all Boston shippers in the Lancaster area.

Routes varied all the way from one where milk was brought on a wheelbarrow in summer and a sled in winter to one where some five thousand pounds were hauled by a single truck. About 26 out of a total of nearly 300 producers hauled their own milk in June, 1937. (This number was below the average of the past few years and was a temporary situation which lasted only until the new co-operative plant was put in operation in August, 1937.)

Producers hauling their own milk supplied about 12 per cent of the milk handled through Lancaster plants at the time this study was made. Their importance in other parts of the state supplying the Boston market was higher than that indicated above, the percentage of producers delivering their own milk tending to increase as the size of the country plant decreases.

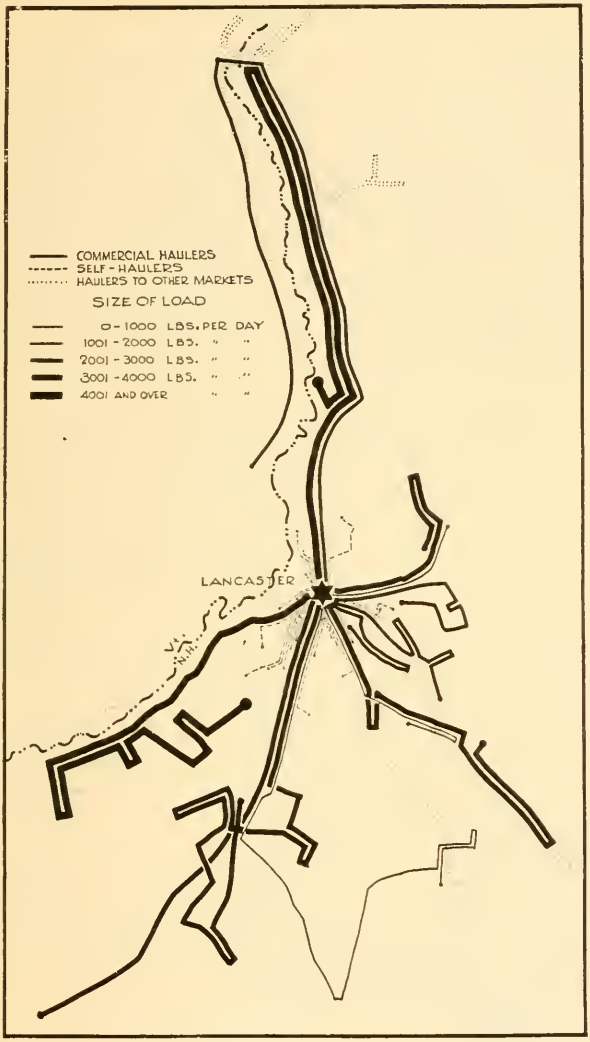

FIGURE 3.
Truck routes in the Lancaster area, June, 1937.

Equipment used by producers bringing their own milk varied among trucks, pleasure cars, teams and even the wheelbarrow noted above. All these producers lived close to town and commercial trucking rates would probably have to fall very low in order to cause many of them to stop hauling their own milk.

About 88 per cent of the milk delivered to Lancaster plants came on what are termed in this study "commercial truck routes." These were routes where definite charges were made for the transportation of milk. Arrangements whereby two or more producers alternated carrying each other's milk were not classed as commercial routes.

Commercial routes serving Lancaster plants were similar to those in other parts of New Hampshire where producers sell to large Boston

handlers. The following paragraphs, then, apply to other areas in the state in addition to Lancaster.

All trucks were owned and operated by independent operators who made their contracts with producers and planned their routes themselves. Handlers to whose plants the milk was brought, took no active part in setting rates or arranging routes, although they usually collected the hauler's charges for him by deducting it from the milk check.

In contrast to this separation of the handling of milk at the country plant and the operation of the truck routes, in many parts of the United States these two operations are under the same control. Where such a situation exists, the producer is frequently required to send his milk on a particular truck and pay the rate set if he wishes to sell milk to that particular plant. Such a system may be operated so as to burden the producer with transportation charges greatly in excess of the cost of the service rendered.

TABLE I. Description of commercial truck routes operating in Lancaster and Nashua, daily average, June, 1937.[1]

	Lancaster	*Nashua*
Total number of routes	13	16
Type of operator	Independent	Independents and distributors
Total distance traveled (miles round trip)	24.5	21.5
On hard road—miles	19.3	16.3
On unpaved road—miles	5.2	5.2
Number of stops made	13.8	6.0
At individual farms	13.4	5.8
At collection points on main road	[2]	[2]
Number of farms served	14.2	6.0
Amount of milk collected—pounds	3077	1585
Per stop—pounds	223	264
Per farm—pounds	216	264
Capacity of truck—tons	1.5	1.1
Time from garage to plant—hours	3.1	1.2
Number of men employed on truck	1.0	1.0
Gross income	$6.28	$4.28
Charges per hundredweight—cents	20.38[3]	27.74[4]

[1] Average per route except where noted.
[2] Less than one per route.
[3] Weighted average 20.41 cents.
[4] Weighted average 27.00 cents.

Including two routes operating almost entirely in Vermont, there were 15 commercial truck routes carrying milk to Lancaster in June, 1937. Significant data regarding the 13 routes which are largely within New Hampshire are given in Table I. This table does not show, however, the wide variation between routes. For this reason the averages presented are apt to be misleading and may be typical of none of the routes, and therefore should be used with great caution.

This description of the hauling of milk in the Lancaster area indicates the general pattern of milk trucking in the Connecticut River valley, where most of the milk goes to country stations supplying the Boston market. In the following section the trucking of milk in a different section of the state to a different market is outlined.

Transportation of Milk to Nashua

The Nashua market is chosen as an example of the trucking of milk to local markets within New Hampshire and secondary Massachusetts markets across the state line.

Nashua is a city of 31,463 population, situated in the southern part of the state on the Merrimack River. The city lies in a type of farming area in which wholesale milk and hens predominate.

There are no Boston collection stations in Nashua and practically all the milk hauled to the city is consumed there. In 1935-36, daily distribution of milk and cream averaged 15,805 quarts.[4] Except for a few hundred quarts, all of this was distributed by 20 dealers.

Production, while not so concentrated as that in the Lancaster area, is neither so scattered as in some parts of the state. The milkshed extends over 20 miles to the northwest of the city but only about five miles to the east and south. In addition to this area, varying amounts of milk and cream are brought by one dealer from country plants located at West Rumney and Laconia. The trucks hauling this milk will not be included in this discussion.

Figure 4 shows the routes by which milk is brought to the Nashua markets. Routes shown refer to wholesale milk only, and the same method of presentation is used as in Figure 3. Data refer to June, 1937.

There is considerably more duplication of hauling facilities in Nashua than in Lancaster, and routes varied even more widely. Producers hauling their own milk accounted for about nine per cent of the whole-

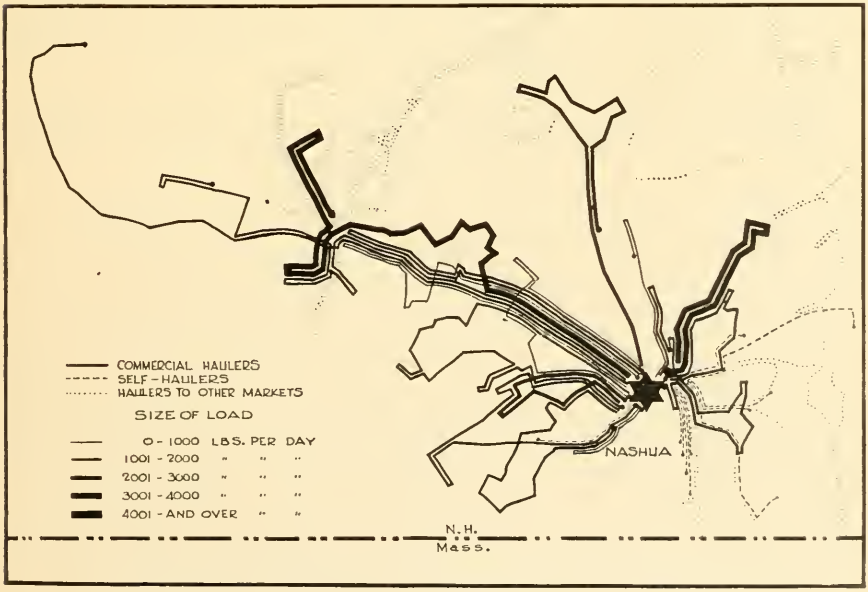

FIGURE 4. Truck routes in the Nashua area, June, 1937.

[4] According to records of New Hampshire Milk Control Board.

sale milk; independent haulers for 40 per cent, and dealers' trucks for 51 per cent. These figures, taken in conjunction with Figure 4 indicate a strikingly different "trucking pattern" from that found in the Boston supply area. There, no dealers' trucks were reported. In Nashua, this group was important.

As in Lancaster, producers bringing their own milk used a variety of conveyances. Pleasure cars and trucks were of greatest importance. In a number of instances, producers worked in Nashua and brought the milk on their way to work.

Routes operated by dealers' trucks were those in which either the dealer himself or an employee hauled the milk. Many of the Nashua dealers who trucked milk did so largely as a service to their producers, who were usually free to haul their own milk if they preferred. Rates were fixed by the dealers and in many cases were set at the levels authorized by the bargaining co-operative to which many of the producers in the area belong. These rates tended to be higher than those charged by independent truckers to producers in corresponding localities. Payment of a flat price at the farm, often results in producers being unaware of the amount allowed for transportation. This may in part account for the existence of a rate structure in the Nashua milkshed which charged producers living only two or three miles from the market higher rates than those 10 or 15 miles distant.[5]

The 16 commercial routes to Nashua showed fully as much, if not more, variation than did those in Lancaster. Table I shows average figures which, while of value for purposes of comparison with those of Lancaster, should be used with great care.

The comparison of Lancaster and Nashua suggests some interesting conclusions. Before discussing them further it would seem advisable to include other truck routes throughout the state so that any generalization might be applicable to a greater area.

General Features of the Commercial Hauling of Milk in New Hampshire

Commercial truck routes as distinguished from routes where individuals haul their own milk or exchange hauling with neighbors, accounted for about 88 per cent of the milk handled by country stations in Lancaster and about 91 per cent by city plants in Nashua.

These proportions do not hold for all country stations and city plants in New Hampshire. Some of the smaller handlers receive all milk from "self-haulers"; while at the other extreme, at a few plants nearly all the milk is collected on commercial truck routes. Including all handlers in New Hampshire who receive fluid milk from producers, milk hauled on commercial routes averages about 82 per cent of the total. Expressed in terms of numbers of producers, the percentage is 83.

These figures indicate the dominant position held by commercial truck routes in the field of milk hauling. Because of their importance and because the non-commercial routes by their very nature cannot be included in an analysis of charges, this and following sections of the study are confined to commercial routes.

[5] For detailed description of rates see below, page 23.

TABLE II. Description of commercial truck routes operating largely within New Hampshire, June, 1937.

	Total Daily	*Average Daily*
Number of routes	152	
Gross income	$1,009.08	$6.64
Volume of milk transported—pounds	426,155	2,804
Total distance traveled—miles	5,854.1	38.5
Unpaved road—miles	1,098.1	7.2
Number of stops	1,826.0	12.0
Milk collected per stop—pounds		233
Milk collected per farm—pounds		215
Rate charged per cwt.—cents		23.68
Cost per farm—cents		51

In June, 1937, commercial truck routes to the number of 152 operated largely within New Hampshire. Significant data regarding these routes appear in Table II. These data refer to June, the month of peak production, and this fact should be kept in mind when interpreting them.

Several items in Table II bear mention. Over $1,000 per day was charged New Hampshire producers during June, 1937, for hauling their milk from farm to plant. On a hundredweight of milk basis, the average charge was 23.68 cents. On a per farm basis, the daily charge averaged approximately 51 cents. Allowing for seasonal variation in milk production, the yearly bill for transportation of milk from farm to plant is estimated at about $300,000.

Other averages presented in Table II must be used with great caution. Individual routes vary so widely that the averages given may not be typical and merely indicate summary figures for all routes studied.

The equipment to haul this milk represents a large investment. Figure 5 summarizes the trucking facilities used on most of these commercial routes. Though many different models and capacities of trucks are in use, the typical truck has a stake body, a capacity of 1½ tons and is comparatively new.

Only a relatively small number of trucks are used for other purposes than milk hauling. While a few of the larger trucks are used on farm work or on regular express routes, most of the trucks used for other purposes are small pick-up trucks of one-half ton capacity.

The time required from leaving the garage until arrival at the plant averages two and a half hours. Many routes require only an hour or two to collect their loads, leaving the major part of the day free to carry on other activities. Where independent truckers operate such routes, they very frequently regard their trucking activity as a part-time enterprise to be combined with the operation of a dairy farm. This is particularly the case in the wholesale dairy region in the Connecticut River valley where many of the smaller truck routes are operated by farmers.

In the case of distributors' trucks or of most independent truck routes in the remainder of the state, trucking is either combined with operating a milk distributing business in the case of the distributor, or is a full-time job in the case of many independents. This phase of milk transportation will be discussed later in the study.

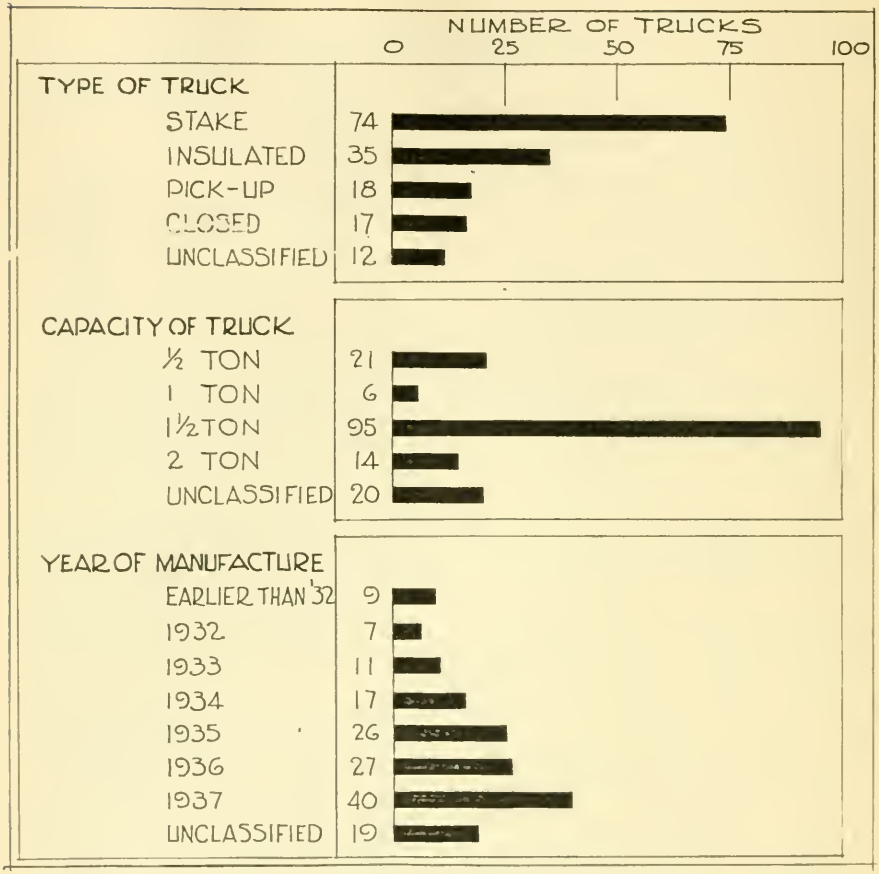

FIGURE 5. Equipment used for trucking milk.

With a very few exceptions, only one man goes on the truck.

Ice is furnished on some 27 routes out of the 152, and usually only during the summer months. Ordinarily no extra charge is made for this service, although the furnishing of ice may have been taken into account when setting rates. It is used mostly on the longer routes in the central and southern parts of the state.

Comparison of Physical Characteristics of Routes Classified According to Region and Operator

Individual routes vary so much that many of the summary figures presented in the preceding section (especially those in Table II) must be used with care. In this section an attempt is made to secure more typical figures by classifying routes into certain significant groups and presenting averages for these groups.

Two bases of classification have been used to bring out significant differences. The truck routes were first classified according to the part of the state in which they were located and then further classified into

those operated by independent haulers and those operated by distributors.

The classification according to locality was made by including in one group all routes operating in, or adjacent to, the Connecticut River valley (henceforth referred to as the Connecticut valley) ; and in a second group, routes in the Merrimack valley and coastal region (henceforth referred to as the Merrimack-Coastal region). (Figure 2, page 7) Several factors prompted this classification. Perhaps of greatest significance is the fact that most of the Connecticut valley is included in the type of farming area in which production of milk for wholesale markets reaches its highest degree of specialization. Farms are relatively large and close together and opportunities for economical trucking of milk are present in greater degree than in most other parts of the state.

Another reason for making this classification is that practically all of the milk hauled on commercial truck routes in the Connecticut valley goes to country stations, while that collected on routes in other parts of the state goes largely to city plants.

The routes were also classified according to whether they were operated by independent contractors or by distributors. Independent contractors included operators who owned their trucks, planned their routes, set their charges and, aside from the distributor deducting hauling charges and indicating producers whose milk was to be collected, had complete control of their own trucking business. Distributors' trucks were those owned and operated by, or under the direct control of, a distributor who set rates, planned routes, and generally supervised their operation.

Using the two bases of classification outlined above on the 152 commercial routes operating in New Hampshire, 88 were found to lie in the Connecticut valley and only 64 in the Merrimack-Coastal region. Of the routes in the Connecticut valley, all but two were operated by independent contractors. Of those in the Merrimack-Coastal region, distributors' trucks were more of a factor. Of the 64 routes, 19 were operated by distributors.

Table III shows the data of Table II classified in the manner outlined above. Because of the existence of only two distributors' truck routes in the Connecticut valley, it is with hesitation that data regarding them are presented, and readers are warned against basing conclusions upon so small a sample.

Two comparisons appear valid: First, that of independent haulers' routes in the Connecticut valley with independent haulers in the Merrimack-Coastal region; second, that of independent haulers' routes in the Merrimack-Coastal region with distributors' routes in the same section.

Significant differences are brought out by each of these comparisons. Considering first, that of independents in the one part of the state with independents in the other: Table III shows that though the average amount of milk hauled per independent route varied only slightly in both sections of the state, routes in the Merrimack-Coastal region traveled more than half as far again as those in the Connecticut valley. They traveled over more unpaved road, made more stops, and handled milk from a third more farms than did those along the western part of

TABLE III. Comparison of truck routes according to location and type of operator, daily average, June, 1937.[1]

	Connecticut valley		Merrimack-Coastal region	
	Independent	Distributor	Independent	Distributor
Total number of routes	86	2	45	19
Gross income	$5.96	$3.07	$8.71	$5.15
Volume of milk transported—pounds	2915	1165	3111	1743
Total distance traveled—miles	33.6	42.7	54.9	21.4
Unpaved road—miles	7.0		8.2	6.9
Number of stops	12.0	4.0	14.1	8.1
Milk collected per stop—pounds	243	291	221	215
Milk collected per farm—pounds	232	291	191	211
Rate charged per cwt.—cents	20.46	26.31	28.01	29.54
Cost per farm—cents	47	76	53	62
Time from garage to plant—hours	2.5	3.0[2]	2.9	1.7

[1] Average per route except when noted.
[2] Based on one route only.

the state. Not shown in Table III is the fact that proportionately many more routes in the eastern section used ice during summer months than did those in the Connecticut valley. Transportation charges per hundredweight of milk hauled by independents were substantially lower in the Connecticut valley than in the Merrimack-Coastal region.

So large a number of factors influence the make up of a truck route that it is not practicable to attempt to account quantitatively for all the differences indicated above. Since dairying is more dense and farms have more cows in the Connecticut valley, trucks can obtain the same load by traveling less distance with fewer stops in that section than in the Merrimack-Coastal region.

It seems probable, therefore, that these differences in the dairy production pattern of the two areas have a great deal to do with the differences found in the physical characteristics of truck routes. Regarding the charges levied (which differ appreciably between the two groups), discussion of them is deferred to a later section.

Turning now to a comparison of independent truck routes and distributors' trucks operating in the Merrimack-Coastal region, significant differences appear. On the average, distributors' trucks carried only about one-half as much milk as did independents. Milk collected per stop was about the same but number of stops per route made by distributors' trucks averaged only slightly over half those made by independents. Rates charged by distributors averaged slightly higher than those charged by independents.

In order to find an explanation of these differences it is necessary to look elsewhere than location of routes. As this comparison of independents and distributors' routes covers the same section of the state, different opportunities arising from different densities of production or types of farming are not present.

The basis upon which these two groups of routes have been differentiated is that one group was operated by independent operators and the other by distributors. This suggests that an explanation of the

differing characteristics of the two sets of routes may be found in the different reactions of independent truckers and distributors to the opportunities offered for employment of energy and resources in the trucking of milk.

In the first place, the independent trucker ordinarily is either already trucking milk when he purchases a new truck or purchases his truck with the idea in mind of trucking milk. Hence, he tends to purchase a truck of the type and capacity best suited to the route which he is already operating or is planning to operate. In the Connecticut valley the typical truck used to haul milk was of 1½ tons capacity. Routes with trucks of less than that capacity usually hauled relatively small loads of milk with consequent small daily returns.

It seems probable, therefore, that few independent truckers planning to continue in the trucking business or to enter the business would purchase trucks of less than 1½ tons capacity. And in order to use such trucks to their best advantage operators would ordinarily plan on handlings of at least 2,000 pounds of milk daily.

Small distributors, on the other hand, do not ordinarily purchase equipment for the purpose of collecting milk from producers. Trucks are ordinarily bought with an eye to delivery needs where light trucks are usually used. Since many of the distributor routes are operated by dealers buying from less than 10 producers, some of whom may bring their own milk to the dealer's plant, a truck of small capacity can haul all the milk on one trip. Because the equipment is already available—the delivery truck—and because time spent in collecting milk may be more profitably used than in the distributing end, and also because of such less tangible returns as daily personal contact with the producer, delivery of milk at the plant when most convenient, and so forth, the small distributor has tended to haul his own milk.

Apparently, it is this ability to use time and resources more profitably in collecting milk than in enlarging the distributive end of the business, that has led to the formation and operation of many of these distributors' routes. Possibly in a few cases, some monopolistic element by which the distributor could charge rates higher than those necessary to provide the service has led to route operation by distributors in New Hampshire, but instances in which this is the prime motive seem rare. This matter will be discussed at some length in the sections dealing with trucking charges.

Trucking Charges Under Conditions of Perfect Competition

If equipment and man power were employed to their best possible advantage, and if producers in the milkshed had their milk hauled at charges set on a freely competitive basis, such an analysis of those charges as that contained in the following sections of this study would be unnecessary. But it is evident that such a situation does not exist in New Hampshire. Diagrams of truck routes in Lancaster and Nashua show considerable duplication of distance traveled. The use of trucks of 1½ tons capacity for hauling as little as 600 pounds of milk in the flush season indicates equipment not employed to its best advantage. With such duplication of mileage and equipment, reor-

ganization of routes would offer opportunities for more efficient use of manpower, indicating present inefficiencies in this respect.

Leaving for a future study the consideration of readjustments of routes, of equipment and of labor; and taking as given the present organization of routes, equipment and labor, are charges based upon services rendered and, if not, upon what bases are they set? The following sections attempt to answer this question.

Several considerations make it desirable to use as a standard for comparison the system of trucking rates that would become established under conditions of perfect competition. Under such conditions, charges would be such that no gain could be made by producers shifting from one route to another—in other words, charges would be at a minimum. Likewise, routes would be such that no reorganization of them would reduce the total costs involved in hauling the milk from farm to country station or city plant.

Throughout this study the term perfect competition is used in the economic sense. In that sense it requires, among other things, that the numbers of buyers and sellers be large and the commodity uniform. Applied to the hauling of milk this would mean that many producers were free to bargain with many transportation agencies for the commodity "milk transportation." It would require that all transportation agencies offer the same quality of transportation so that it would be immaterial to the producer or the distributor which operator hauled the milk providing the charges made were identical. Quality of transportation would be identical, therefore, whoever provided it, though quantity would vary. Truck routes would have to be fluid in the sense that any of several trucks might immediately rearrange its route in order to pick up or drop milk from any producer should the rate charged that producer be out of line with other rates in the market. (While they are ordinarily by no means as fluid as required under conditions of perfect competition, truck routes are unlike railways, where roadbeds are fixed and routes are therefore to a large extent fixed.)

Under such a system, each truck operator would strive to maximize his net returns from his trucking operations. It would not matter to him whether rates varied or were identical among producers, so long as his net return from his route was maximized. But in order to have perfect competition in the setting of rates, not only must truck operators compete with one another for whole *routes* but also, they must compete for *individual producers*.[3]

[3] The concept of transportation agencies competing for milk from *a particular producer* should be noted, as the resulting rate structure may differ from that to be expected where transportation agencies compete only for *whole routes* and not for individual producers. It is from this standpoint of viewing the whole trucking operation as a unit that the tendency to conclude that the nearby producer should pay the same rate as the man whose farm is on the edge of the milkshed, has sprung. According to those holding this view the hauling costs depend to a large extent on the distance from the first farm to the second, from the second to the third, and so on around the route. In this case, the fact that the individual truck driver is concerned largely with the total net return for the route and not with the individual charges, may result in rates to individual producers within a route being somewhat arbitrary and not following closely the pattern to be expected under perfectly competitive conditions.

Under conditions of perfect competition, uniform rates to producers at different distances from the dealer's plant would not be found, (assuming other conditions to be uniform, producers evenly distributed about a market, equal distances apart, equally good roads, etc.). There are several reasons for this. First of all in considering the behavior of the seller of transportation, the truck operator, the mistake should not be made of assuming that decisions are always based on whether the whole route should be operated or no route at all. Ordinarily, this is not the decision. Instead, the truck operator decides whether or not it would increase his net returns to take on (or drop off) a particular producer. The price at which transportation is offered, therefore, depends on whether or not the operator believes the additional revenue will exceed the additional expense.

Under conditions of free competition assuming that the distribution of producers throughout the milkshed is uniform, the operator would offer transportation to a producer, the collecting of whose milk involved no extra mileage, at a lower rate than that offered a producer the collecting of whose milk did require the traveling of an additional distance. Under assumptions of uniform distribution of producers in each direction from the plant, this would result in nearby producers being offered lower rates than producers more distant from the plant. An exception would be found in the case where the operator of the truck route had his headquarters at a distance from the plant; but with a number of trucks operating in that territory, unless all operators lived in the same section of the milkshed, competition would result in the same rate structure as in other parts of the area.

Turning now to the purchaser of transportation, a similar situation is found. A maximum rate, above which producers will prefer to do without hired transportation and will haul their own milk, will be considerably higher at 10 miles from the market than it is at five miles. The existence of the alternative of hauling his own milk or exchanging hauling with neighbors, works in the direction of increasing rates as distance from the market increases, and is particularly active close to the market.

With both buyer and seller of transportation being affected by distance from market, rates in a perfectly competitive system would tend to increase as distance from market increased, other things being constant.

At first glance, the existence of a rate structure graduated out from the market might be expected to result in truck routes of the same length and volume of milk having different average rates. For instance, the route which procured its milk from farms relatively close to market might be expected to have an average rate lower than that which operated directly out from the market. But under the competitive conditions which have been assumed, routes traveling the same distance and collecting the same amount of milk from the same number of producers would not be found operating in this manner. Instead, they would be planned in such a way as to minimize total distance traveled and maximize total returns and so routes of the same length and volume would be expected to have the same average rates.

We find, therefore, that under conditions of perfect competition, rates charged producers would vary with distance from the market and that average rates charged by trucks collecting equal total loads over equal distances would approach equality.

This, then, is the standard of competition in trucking milk. Under similar road conditions, distribution of farms, and so forth, truck routes of equal length and volume should have the same average rates. All other factors being equal, a variation in average load for trucks traveling the same distance should be reflected in a difference in average rates. If rates in both cases were the same, trucks traveling longer distances would tend either to charge distant producers greater amounts or to consolidate their routes in order to reduce distance traveled; or, if total distance were to remain the same, they could change the course of the route in order to include more distant (and therefore high-rate) producers. Regardless of the method of adjustment adopted, rates would tend to equalize for routes of the same distance and if differences in distance persisted, they would be reflected by different average charges. (Such a situation would exist when variations in density of production occurred; the truck route operating in sparsely settled territory would have to cover more miles in order to procure the same amount of milk, and as truck operating costs are directly affected by mileage, rates would have to be higher in order to attract resources into truck operation to serve such producers.)

Similarly, where other conditions are constant, rates in a competitive system should vary with the amount of milk carried per mile traveled.

Analysis of Trucking Charges

The variations in trucking charges to be expected under conditions of perfect competition have been outlined in the preceding section. Do the charges actually levied accord with those expected under perfect competition, or are imperfections in competition present? And if such imperfections are found, of how much importance are they?

I. Extent to which average charges on similar routes approach equality:

Under freely competitive conditions, average rates on truck routes of about the same length, traveling over roads of about the same quality and collecting about equal volumes of milk, would be nearly identical. Small differences might be expected from additional services supplied on some routes such as ice in summer, empty cans returned the same day, insulated truck bodies, and so forth; but such differences should seldom amount to more than one or two cents a hundredweight on a yearly average basis.

By separating the routes into groups in which distance traveled and volume of milk hauled are similar, and by comparing the variation of charges within each group, an estimate of the extent to which competitive forces have operated to level rates out may be obtained. Table IV shows by groups in which distance and volume are similar the range of charges and average charges throughout the state. (By "range of charges" is meant the range of average charges of routes, not of individual charges within routes.)

TABLE IV. Number of routes, range of average charges, and average[1] charge on commercial truck routes of various lengths and volumes, June, 1937.

Miles	1-500 pounds			501-1000 pounds			1001-2000 pounds			2001-3000 pounds			3001-4000 pounds		
	No. routes	Charges per cwt.		No. routes	Charges per cwt.		No. routes	Charges per cwt.		No. routes	Charges per cwt.		No. routes	Charges per cwt.	
		Range	Av.		Range	Av.		Range	Av.		Range	Av.		Range	Av.
		cents	cents		cents	cents		cents	cents		cents	cents		cents	cents
1– 10	2	25–29.07	27.04	4	10–20	13.75	5	15–25	21.00	2	15–23.25	19.13			
11– 20	2	20–23.25	21.62	7	15–30	23.06	21	5–34.88	20.77	7	15–32.20	19.60	6	15–25	21.17
21– 30	2	23.25–25	24.12	3	25–32.8	29.27	6	15–30	24.13	4	20–30.00	24.00	4	10–20	16.25
31– 40							9	20–30	22.40	3	15–21.10	18.70	3	22–30	25.67
41– 50				1	25	25.00	1	35	35.00	5	19.5–25	22.94	3	25–35	28.33
51– 60							1	25	25.00	2	20 –22	21.00	1	17	17.00
61– 70							3	25–46.5	32.83				2	30–40	35.00
71– 80							1	25	25.00				1	25	25.00
81– 90							1	25	25.00				1	25	25.00
91–100															
101 up													1	25	25.00

Miles	4001-5000 pounds			5001-6000 pounds			6001-7000 pounds			7001-8000 pounds			8001-9000 pounds		
	No. routes	Charges per cwt.		No. routes	Charges per cwt.		No. routes	Charges per cwt.		No. routes	Charges per cwt.		No. routes	Charges per cwt.	
		Range	Av.		Range	Av.		Range	Av.		Range	Av.		Range	Av.
		cents	cents		cents	cents		cents	cents		cents	cents		cents	cents
1– 10															
11– 20	2	15–20	17.50												
21– 30	3	15–22	19.67	2	15–20	17.5	1	20	20.00						
31– 40	3	15–20	18.33												
41– 50	4	20–35	24.25				3	20–40	26.67						
51– 60	1	20	20.00												
61– 70	1	25	25.00							1	18	18.00	1	35	35.00
71– 80	1	23.25	23.25				2	21–25	23.00	1	35	35.00			
81– 90							1	20	20.00						
91–100	2	25–40	32.50										1	25	25.00
101 up	4	25–35	28.75	3	25–35	30.0							1	25	25.00

[1] Simple average.

While the range of charges of similar routes shows only the difference between the lowest and highest route and is therefore easily affected by abnormal cases, it does give a rough measure of the degree of variation present within the group.

Considering only those groups containing five or more routes, none show a range as low as might be expected under freely competitive conditions. The ranges most frequently found are 10 and 15 cents. (The range of 30 cents found in one group would be lowered to 20 cents if one truck route, on which a temporary situation had lowered the rate to five cents, were omitted.)

The standard deviation is a much more accurate measure of variation than is the range. Unlike the range, it takes into account the variation of all the charges and not only the lowest and highest. The standard deviations for groups containing five or more routes were found to be about five cents. Broadly interpreted, this means that about two-thirds of the routes in each group show charges within five cents above and five cents below the average charge for the group (a total variation of ten cents), and that one-third of the routes have charges outside these limits.

To compare the variation within different groups, the standard deviation is expressed as a percentage of the average for each group, and the result is termed the co-efficient of variation. Most of the groups show co-efficients of variation[7] in the neighborhood of 20 per cent.

Judging from these measures of variation, charges for routes carrying similar volumes of milk and traveling similar distances show much greater variation than would be expected if freely competitive conditions existed and charges were based upon services rendered. If those routes with rates near the lower limit of the group are charging enough to cover their costs and allow for replacements, then routes within the same group but with charges near the upper limit must be receiving more than the income necessary to provide and maintain efficient trucking service. That many of the routes charging low rates have been in operation for some years; that, in general, trucks are comparatively new (about one-half of the trucks were 1936 or 1937 models); and that there appears to be no correlation of rate with age of truck—these facts suggest that most operators have found the rates sufficiently remunerative for them to continue in business.

II. Extent to which individual charges paid by producers vary with distance from market:

It has been seen above that under conditions of perfect competition charges paid by producers should vary with their distance from market, density of production remaining constant. An attempt to ascertain the individual rate structure about typical markets is presented in Figure 6 and Appendix Table III.

In the preparation of this chart and table, the rates paid by individual producers shipping to Lancaster and Nashua have been spotted on maps and the average rates paid by shippers within various radii of the mar-

[7] Appendix Table II shows standard deviations and co-efficients of variation for each of the groups containing five or more routes.

kets together with the standard deviation and the range of those rates have been calculated.

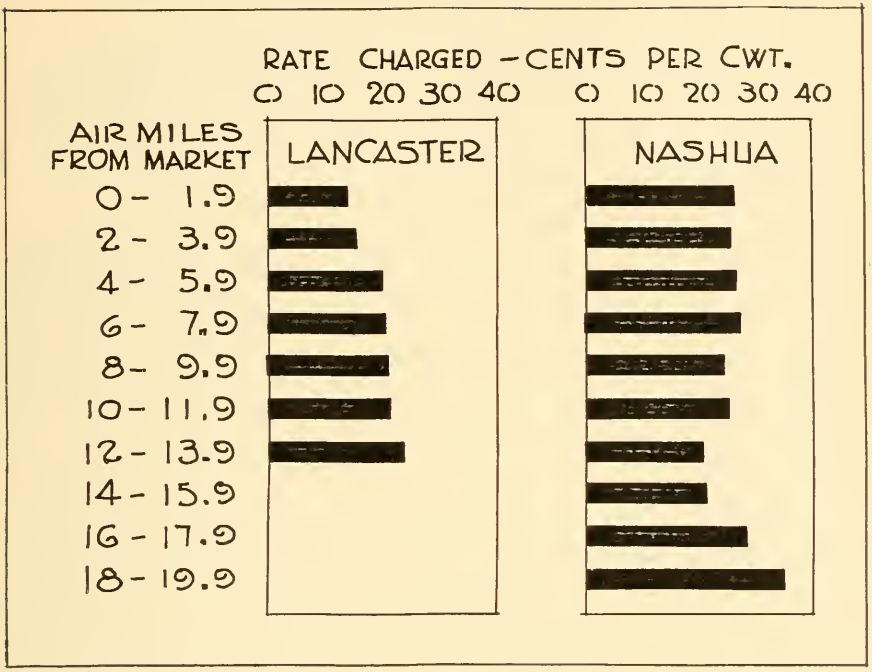

FIGURE 6. Average rates charged producers living various distances from Nashua and Lancaster.

The rate structures about these markets are quite different. As seen in Figure 6, rates increase regularly with distance from market in the Lancaster area, but do not in the Nashua area. Indeed, if the two most distant groups (comprising only four producers) are disregarded, there is a definite tendency for rates in the Nashua milkshed to decrease with distance from market. Such a rate structure is contrary to that expected under competitive conditions where rates would tend to vary with the transportation services rendered. While uniform conditions are not found in either of these areas, nevertheless, the variation in density of production or size of farm is probably not so great as to warrant any very great difference in charges between producers living the same distance from market. Actually, the range and standard deviation found in most groups in the Nashua area exceed very much those in the Lancaster area. In both milksheds, there is considerable variation in charges to individual producers that cannot be accounted for by differences in amount of milk shipped, production densities of farms, or road conditions.

This comparison of rates charged producers living within the same radius of the market is complicated by the tendency of production to be concentrated about some roads and sections and scattered about

others.[8] In order to get around this difficulty, an estimate was made of the percentage of the total number of routes on which individual charges varied with distance (Table V).

TABLE V. Routes varying charge with distance, June, 1937.

	Total number of routes	Charges varying with distance	
		Number	Percentage
Connecticut valley—Independents	86	32	37
Merrimack-Coastal region—Independents	45	16	36
Merrimack-Coastal region—Distributors	19	6	32
Total	150	54	36

Only slightly over one-third of all routes show a variation of individual charge with distance from market, and in many of these the variation consists merely of charging two different rates, one for those within a certain distance and the other for those beyond this distance. There appears to be no significant difference between the three groups of routes—Connecticut valley independents, Merrimack-Coastal independents, and Merrimack-Coastal distributors—in this respect.

III. Extent to which individual charges vary with the amount of milk collected per producer:

Other things being equal, a producer with five cans of milk to ship will, under competitive conditions, pay less per hundredweight than one with only one can. The existence of certain costs associated with each loading stop, and not proportional to the amount of milk collected at that stop would result in such a variation in charges.

Table VI shows the number of routes on which individual charges varied with volume. These figures indicate that on only a very small proportion of routes was there a differential rate in favor of the shipper who delivered a large daily quantity of milk. (On many of the routes varying charges with quantity, the adjustment was made by charging a fixed monthly rate to all shippers to which was added an additional per hundredweight rate—thus making an average per hundredweight charge of less to the large producer than to the small one.)

TABLE VI. Routes varying charge with volume collected per producer, June, 1937.

	Total number of routes	Charges varying with volume	
		Number	Percentage
Connecticut valley—Independents	86	4	5
Merrimack-Coastal region—Independents	45	9	20
Merrimack-Coastal region—Distributors	19	0	0
Total	150	13	9

IV. Variation among routes similar in volume but differing in distance traveled.

Under competitive conditions, average charges of routes of similar length and volume should approach equality. But when length varies

[8] Where such a situation exists, rates to producers within the same radius might be expected to vary; but average rates would still increase with distance.

with volume remaining constant, costs of truck operation will vary accordingly. (Studies have estimated the cost of gas, oil, tires, depreciation, repairs, and so forth per mile of truck operation at slightly under five cents.[9] Such a variation in direct costs would be reflected in rates. Routes traveling 40 miles to collect 2,000 pounds of milk would have higher average rates than those traveling 20 miles for 2,000 pounds.

The extent to which difference in total distance traveled affected average rates may be discovered by classifying routes into groups according to the volume of milk carried and the distance traveled and comparing the charges on those of the same volume but different distances. Table IV on page 21 shows routes so classified.

All groups do not evidence the same relationship between distance traveled and average charges. While 21 routes carrying 4,001 to 5,000 pounds show a decided tendency towards increased charges with increased total distance, seven routes carrying 6,001 to 7,000 pounds show no significant relationship.

In an attempt to measure the degree of variation of average charge with distance traveled, co-efficients of correlation were calculated for some of the routes. Averages within each volume group were correlated with average rates, and individual route distances were correlated with rates on individual routes.

In order that the effects of any factors peculiar to only a part of the routes might be eliminated, correlations were made taking only routes operated by independent contractors in the Connecticut valley. Other separate groupings were made of routes in the Merrimack-Coastal region operated by independents, and routes in the Merrimack-Coastal region operated by dealers. By separations such as these it is believed that homogeneity of observations within the group was attained.

Correlation co-efficients are contained in Appendix Table IV. With a few exceptions, the degree of correlation of average charge with distance traveled was small. The highest co-efficient of correlation found was only .70 and only a few were above .50.

It may be concluded that while there is a tendency towards increase of average charges with total distance, the relationship is not close and is far below that to be expected under conditions of perfect competition.

V. Relationship between average charge per route and total volume of milk carried.

In the preceding section an attempt has been made to measure the relationship of average charge per route and total distance traveled, keeping volume constant. Another comparison of importance is that of routes of similar distances but differing volumes of milk. The same technique as that used in the preceding section has been employed and typical findings are shown in Appendix Table IV.

Costs of trucking increase only slightly as the load increases. A load of 4,000 pounds does not double costs over one of 2,000 pounds—it

[9] Bartlett, R. W., and Caskey, W. F.; Milk Transportation Problems in the St. Louis Milkshed; Illinois Agricultural Experiment Station Bulletin 430, p. 448.

Dow, George F.; Costs and Returns in Operating Milk and Cream Collection Routes in Maine; Maine Agricultural Experiment Station Bulletin 374, p. 154.

increases them only slightly, providing distance traveled, road conditions, and other factors remain the same. Therefore, if rates per hundredweight were based upon costs of services, they would decrease with increase in volume carried, distance and other conditions remaining the same.

Some of the groups of routes similar in length show a tendency for rates to decrease with increase in volume. Others show little or no significant relationship.

As in the analysis of the relationship of distance and charges, it may be concluded that there is an association of lower average charges with larger loads of milk, other conditions being constant, but that such association is not close and is far from that to be expected were rates based upon the costs of services rendered.

VI. Relationship of rates to road conditions, services rendered, etc.

Rates might be expected to vary with road conditions and services rendered. Other conditions being equal, costs of operating a truck over unpaved roads are higher than over hard-surfaced roads.

Routes of similar volume and length, but with varying percentages of hard-surfaced road were too few to give any accurate measure of the tendency of rates to vary with road conditions. Enough observations were possible, however, to indicate that the relationship, if any existed, was very slight.

So far as could be determined the relationship of services rendered to charges was also slight. There were instances where such services as the supplying of ice in summer, the use of insulated truck bodies, the returning of empty cans the same day, the collecting of milk at farmsteads in place of collection points on the main road, and so forth, appeared to be taken into account in setting rates. But no accurate measure of their effect on rates could be obtained, and it seems unlikely, especially in view of the lack of consistent relationship of such factors as volume of load and distance of route to charges, that any close relationship existed between services rendered and charges.

VII. Comparison of rates charged by independents' and distributors' trucks in the Connecticut valley and in the Merrimack-Coastal region.

In an earlier section, a comparison was made of the physical characteristics of truck routes operated by independents and by distributors in the wholesale milk section of the Connecticut valley and in the Merrimack-Coastal region. With that analysis and the analysis of charges throughout the state as a background, the following comparison of charges on routes in each of these sub-groups brings out some significant characteristics.

As only two distributors' routes lie in the Connecticut valley section, only the three groups—independent routes in Connecticut valley, independent routes in the Merrimack-Coastal region, and distributors' routes in the Merrimack-Coastal region—are included in the analysis. If there were a larger number of routes, or if the volumes and lengths of routes did not vary so widely, it would be possible to compare rates of all three groups by separating them into sub-groups similar in length and volume. Unfortunately, only a very few such sub-groups are rep-

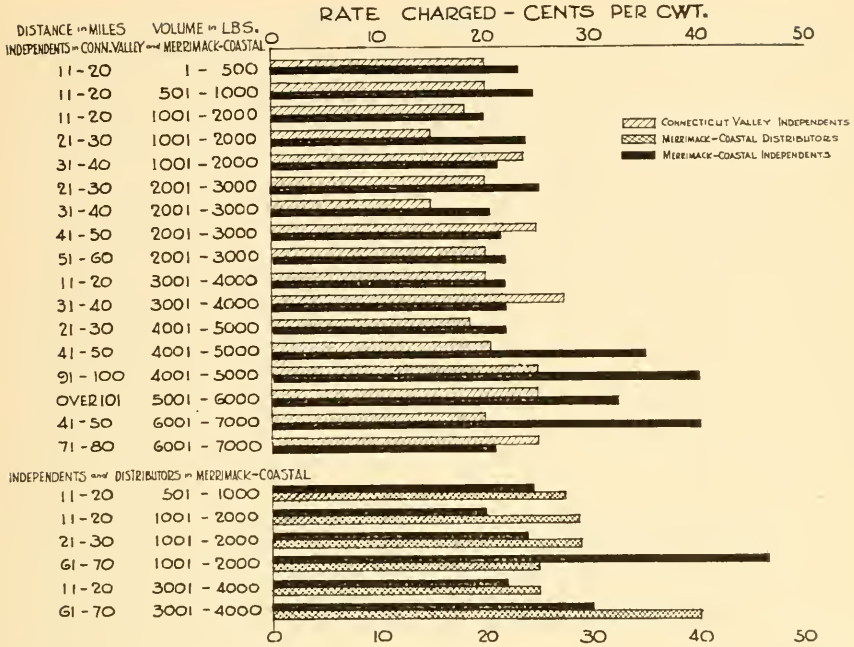

FIGURE 7. Rates charged by independent routes in the Connecticut valley and independents in the Merrimack-Coastal region, and by independents in the Merrimack-Coastal region, and distributors in the Merrimack-Coastal region—comparisons being made between routes similar in length and volume, June, 1937.[10]

resented in all three main groups and recourse has been made to two comparisons: first, independents in the Connecticut valley and in the Merrimack-Coastal region; second, independents in the Merrimack-Coastal region and distributors in the same region.

The results of these comparisons are presented in Figure 7, which shows the average charges of routes similar in length and volume. Rates tended to be higher on similar independent routes in the Merrimack-Coastal region than in the Connecticut valley, and rates of distributors' routes in the Merrimack-Coastal region tended not only to be much higher than rates on independent routes in the Connecticut valley, but also to be higher than independent routes in the Merrimack-Coastal region. The average differential of independent routes in the Merrimack-Coastal region over independent routes in the Connecticut valley was 4.62 cents per hundredweight. Distributors' routes when compared with independent routes in the Merrimack-Coastal region averaged 1.31 cents per hundredweight higher. This latter difference would have averaged 5.88 cents had one extreme observation been omitted.

While the comparison of routes similar in volume and length in Figure 7 presents the difference in charges paid by farmers served by different types of operators in different sections of the state, it may not present a summary picture as well as that contained in Figure

[10] See Appendix Table V for data upon which this graph is based.

8, which shows the percentage of milk hauled at various rates. A striking contrast brought out is that while 97 per cent of the milk in the Connecticut valley is hauled at 27.4 cents or less, 47 per cent of the milk in the Merrimack-Coastal region pays 27.5 cents or more. Comparing independent routes and distributor routes in the Merrimack-Coastal region, over 40 per cent of the milk is hauled by independents for 22.4 cents or less, while no distributor routes show an average rate that low.

A difference which might have an influence upon average rates for similar routes in the two sections of the state is that in the Connecticut valley, a much larger proportion of farmers operate commercial routes than is the case in the Merrimack-Coastal region. Whether alternate opportunities for use of time and equipment by these men differed from those available in the other section of the state sufficiently to affect rates, or whether such differences, if they did exist, would affect rates, is a problem which cannot be solved here. It would appear, however, that such differences in the opportunities for employing labor would not persist over a long period of time within an area as small as the state of New Hampshire.

The comparisons made in this section, as throughout this report, must be interpreted with the knowledge clearly in mind that averages and tendencies are being considered and not individuals. While it is generally true that rates are higher in the Merrimack-Coastal region than in the Connecticut valley, this does not mean that *all* rates are higher; neither must it be concluded that *all* distributors' routes charged higher rates for equivalent services than did independents. That is not true. As has been emphasized throughout this study, there is a very wide variation in rates, and this fact must be kept in mind in

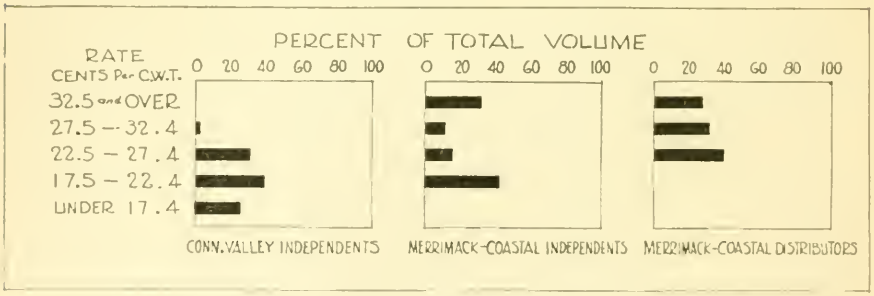

FIGURE 8. Percentage of milk hauled at various rates.

arriving at conclusions. Instances were not infrequent where distributors charged less for equivalent transportation than did independents. Similarly, many independents in the Merrimack-Coastal region charged lower rates than those in the Connecticut valley for equivalent services. The findings noted above refer to averages, not individuals.

Conclusions

The $300,000 a year now being paid by New Hampshire farmers for transportation of milk to country stations and city plants may be reduced in two ways: first, by a reduction of charges on routes where they are above competitive levels; second, by a reorganization of truck routes and milksheds.

This study has considered only the first of these possibilities, the adjustment of rates to a competitive basis. For unless charges take into account the costs of services rendered, there is no guarantee—even should truck routes be reorganized so that a particular route carries twice as much milk while traveling the same distance as before—that the charge on that route would be reduced and the producer share in the benefit. The possibilities for improving the efficiency of milk collection by route reorganization and reallocation of markets are left to a future publication.

Reduction in charges, such as these outlined above, would have the same direct effect on producers' incomes as a reduction of production costs or an increase of production efficiency. All producers would not share alike in such reductions since all producers are not now paying rates out of line with the costs of services rendered. Many efficient routes operate and many charges are reasonable and fair.

In this study several measures have been applied to determine the extent to which rates actually charged coincide with those expected under conditions of perfect competition. These measures showed a very marked divergence of actual charges from those which might be expected were competitive forces active in adjusting rates. It was found to be the rule and not the exception that in groups of routes similar in length and volume differences in average rates charged amounted to 10 cents or more.

Charges did not vary consistently with any variations in distance traveled, volume carried or other factors generally regarded as influencing costs of truck operation. Individuals distant from market sometimes paid lower rates than those near by. With the exception of a few routes, the rate structure appeared to be without plan and to be based more upon custom and bargaining power than upon services rendered.

When routes collecting the same amount of milk from about the same number of farms and traveling about the same distance have *average* charges varying from 15 cents a hundredweight to 30 cents a hundredweight either some rates are too high or some are too low. Though a few instances may be found where rates are below the level necessary to maintain equipment and ensure continued efficient operation, these are not frequent. In the analysis of routes similar in length and volume, many routes falling near the lower end of the range of charges had been in continuous operation for a length of time sufficient to indicate that an adequate income was being received from the route to continue it in efficient operation. This being true, it must be concluded that routes with average rates toward the upper limit of the group are charging more than efficient operation would warrant.

To make more concrete the savings possible by adjusting rates, consider the estimate that if only one route out of five reduced its average rate only five cents per hundredweight, a saving of about $12,000 a year would be realized by the milk producers of New Hampshire.

No attempt has been made in this study to estimate the size of the possible reduction in trucking charges if truck rates throughout the state were adjusted to competitive levels. There is no doubt, however, but that it would be considerable.

Appendix

APPENDIX TABLE I. Average deliveries of milk per day, per dairy to handlers at Boston, 1937.

Month	Pounds	Month	Pounds
January	146.8	July	199.2
February	150.4	August	170.9
March	175.8	September	167.4
April	193.2	October	152.3
May	214.4	November	125.6
June	239.6	December	132.0

New England Milk Producers' Association. Compiled from reports published in New England Dairyman.

APPENDIX TABLE II. Range, average, standard deviation, and co-efficient of variation of charges in groups of similar routes, June, 1937.

Distance	Volume	Number routes	Range in rates	Average rate	Standard deviation	Co-efficient of variation
miles	pounds		cents	cents	cents	per cent
11–20	501–1000	7	15–30	23.06	5.41	23
1–10	1001–2000	5	15–25	21.00	4.90	23
11–20	1001–2000	21	5–34.875	20.77	5.64	27
21–30	1001–2000	6	15–30	24.13	5.35	22
31–40	1001–2000	9	20–30	22.40	3.58	16
11–20	2001–3000	7	15–32.2	19.60	5.64	29
41–50	2001–3000	5	19.5–25.0	22.94	2.54	11
11–20	3001–4000	6	15–25.0	21.17	3.44	16

APPENDIX TABLE III. Range, average, and standard deviation of rates charged producers living various distances from Lancaster and Nashua, June, 1937.

Distance	Lancaster			Nashua		
	Range in rates	Average rate	Standard[1] deviation	Range in rates	Average rate	Standard[1] deviation
miles	cents	cents	cents	cents	cents	cents
0– 1.9	10–15	14.17	1.86	27.8	27.8	
2– 3.9	10–20	16.91	2.97	22–29.07	26.93	1.77
4– 5.9	12–25	19.40	3.77	20–34.875	27.94	3.41
6– 7.9	15–25	20.24	1.87	22–34.875	28.76	5.28
8– 9.9	20–25	20.58	1.60	15–32.8	24.97	5.10
10–11.9	20–25	21.54	2.30	15–32.8	25.48	5.05
12–13.9	20–25	24.00	2.00	20–22.0	21.33	
14–15.9				20–25.0	21.67	
16–17.9				27.0	27.00	
18–19.9				35.0	35.00	

[1] Calculated only when there are five or more observations in the group.

APPENDIX TABLE IV. Co-efficients of correlation for average charge and total distance for routes of similar volumes; for average charge and total volume of milk carried for routes of similar distance, June, 1937.

Factor	Group	Correlation co-efficients			
		All routes	Conn. Valley	Merrimack-Coastal	
			Independents	Independents	Distributors
Distance and rate	Pounds				
	1001–2000	.35	.40	.47	—.07
	2001–3000	.17	.61	—.45	
	3001–4000	.46	.45		
	4001–5000	.65	.70	.17	
Volume and rate	Miles				
	11–20	—.22	—.12	—.46	—.27
	21–30	—.60	—.55	—.29	
	31–40	—.27	—.37	—.24	

APPENDIX TABLE V. Differences in rates charged by independents operating in Connecticut valley and in the Merrimack-Coastal region and by independents and distributors in the Merrimack-Coastal region on routes similar in length and volume, June, 1937.

Length miles	Volume pounds	Number routes	Average rate cents	Number routes	Average rate cents	Differential
		Conn. valley Indep.		Merrimack-Coastal Indep.		Merrimack-Coastal over Conn. valley
11– 20	1– 500	1	20.00	1	23.25	3.25
11– 20	501–1000	3	20.00	3	24.67	4.67
11– 20	1001–2000	15	18.16	1	20.00	1.84
21– 30	1001–2000	1	15.00	3	23.99	8.99
31– 40	1001–2000	4	23.75	5	21.32	—2.43
21– 30	2001–3000	1	20.00	3	25.33	5.33
31– 40	2001–3000	1	15.00	2	20.55	5.55
41– 50	2001–3000	2	25.00	3	21.56	—3.44
51– 60	2001–3000	1	20.00	1	22.00	2.00
11– 20	3001–4000	4	20.00	1	22.00	2.00
31– 40	3001–4000	2	27.50	1	22.00	—5.50
21– 30	4001–5000	2	18.50	1	22.00	3.50
41– 50	4001–5000	3	20.67	1	35.00	14.33
91–100	4001–5000	1	25.00	1	40.00	15.00
Over 101	5001–6000	1	25.00	2	32.50	7.50
41– 50	6001–7000	2	20.00	1	40.00	20.00
71– 80	6001–7000	1	25.00	1	21.00	—4.00
		Merrimack-Coastal Independents		Merrimack-Coastal Distributors		Differential
						Distributors over Independents
11– 20	501–1000	3	24.67	1	27.40	2.73
11– 20	1001–2000	1	20.00	5	28.74	8.74
21– 30	1001–2000	3	23.99	2	28.90	4.91
61– 70	1001–2000	1	46.50	1	25.00	—21.50
11– 20	3001–4000	1	22.00	1	25.00	3.00
61– 70	3001–4000	1	30.00	1	40.00	10.00

APPENDIX TABLE VI. Volume of milk hauled at various rates by independents in the Connecticut valley, independents in the Merrimack-Coastal region, and distributors in the Merrimack-Coastal region, June, 1937.[1]

Rate cents per cwt.	Conn. valley Independents				Merrimack-Coastal Independents				Merrimack-Coastal Distributors			
	Number routes	Volume			Number routes	Volume			Number routes	Volume		
		Pounds	Per cent	Cumulative per cent		Pounds	Per cent	Cumulative per cent		Pounds	Per cent	Cumulative per cent
17.4 or less	28	65,594	26	26								
17.5–22.4	31	98,469	39	65	19	57,912	41	41				
22.5–27.4	22	78,889	32	97	12	20,951	15	56	8	13,309	40	40
27.5–32.4	5	7,716	3	100	5	17,144	12	68	7	10,431	32	72
32.5 & over					9	43,995	32	100	4	9,385	28	100

[1] The two distributor routes in the Connecticut valley hauling 2,330 pounds were in the 22.5-27.4 cents group.